

HA178L00 Series

3-terminal Fixed Voltage Regulators

REJ03D0683-0400

Rev.4.00

Jan 16, 2009

Description

The HA178L00 series three-terminal fixed output voltage regulators. Can be used not only as stabilized power sources, but also as Zener diodes because of their small outline package.

Features

- Maximum output current: 150 mA ($T_j = 25^\circ\text{C}$)
- Large maximum power dissipation: 800 mW
- Over current protection
- Temperature protection circuit
- Ordering Information

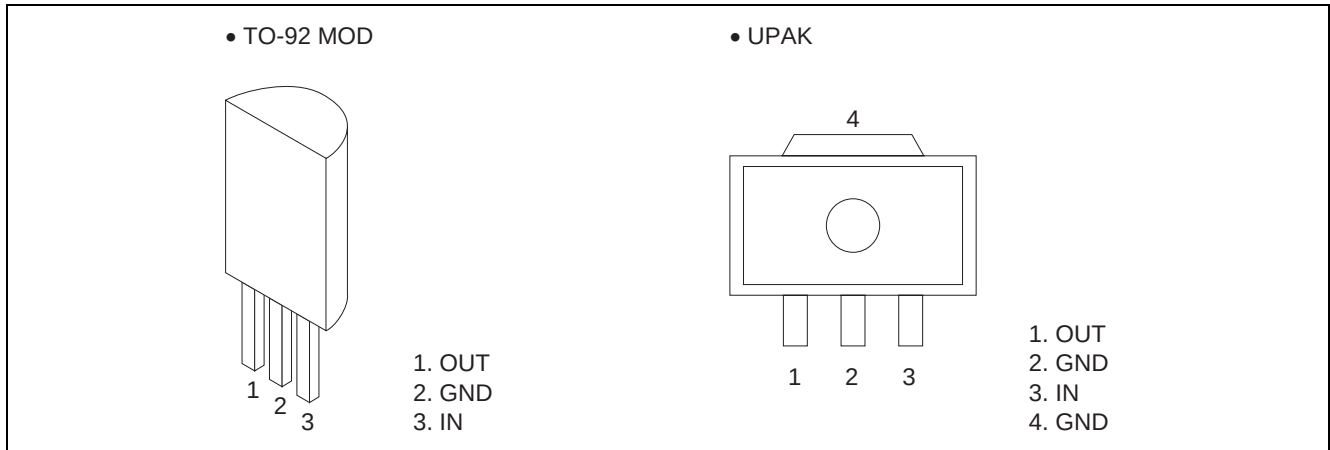
Part No.	Output Voltage (V)	Output Voltage Tolerance (%)	Package Name	Package Code	Taping Abbreviation (Quantity)	Application
HA178L05-TZ	5	±8	TO-92MOD	PRSS0003DC-A	TZ (2,500pcs/box)	Commercial use
HA178L05P-TZ						Industrial use
HA178L05A-TZ		±5				UPAK
HA178L05PA-TZ			Industrial use			
HA178L05UA-TL			Commercial use			

Part No.	Output Voltage (V)	Output Voltage Tolerance (%)	Package Name	Package Code	Taping Abbreviation (Quantity)	Application
HA178L08-TZ	8	±8	TO-92MOD	PRSS0003DC-A	TZ (2,500pcs/box)	Commercial use
HA178L08P-TZ						Industrial use
HA178L08A-TZ		±5				UPAK
HA178L08PA-TZ			Industrial use			
HA178L08UA-TL			Commercial use			

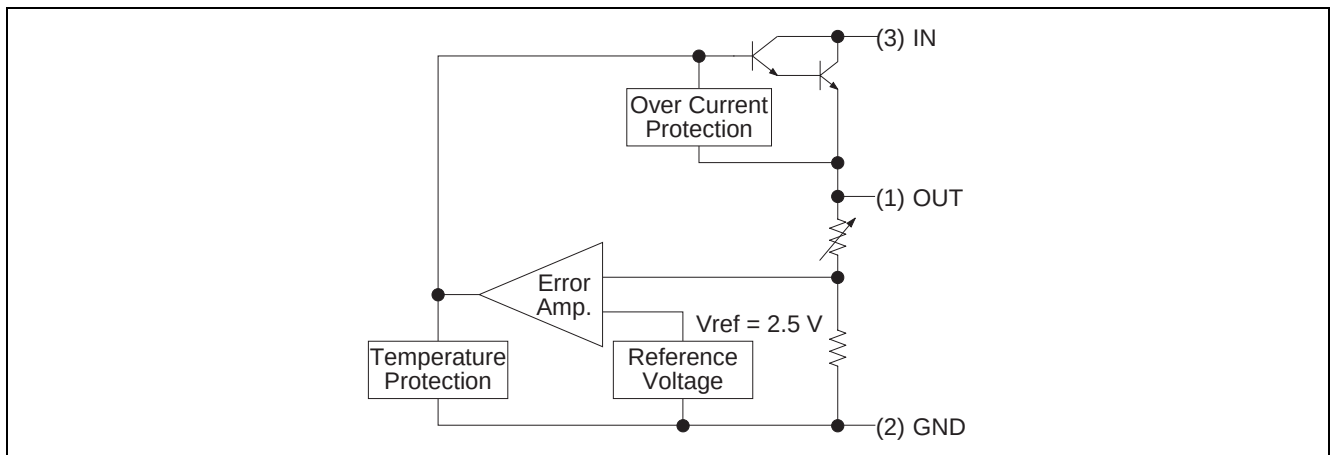
Part No.	Output Voltage (V)	Output Voltage Tolerance (%)	Package Name	Package Code	Taping Abbreviation (Quantity)	Application
HA178L12-TZ	12	±8	TO-92MOD	PRSS0003DC-A	TZ (2,500pcs/box)	Commercial use
HA178L12P-TZ						Industrial use
HA178L12A-TZ		±5				UPAK
HA178L12PA-TZ			Industrial use			
HA178L12UA-TL			Commercial use			

Part No.	Output Voltage (V)	Output Voltage Tolerance (%)	Package Name	Package Code	Taping Abbreviation (Quantity)	Application
HA178L15-TZ	15	±8	TO-92MOD	PRSS0003DC-A	TZ (2,500pcs/box)	Commercial use
HA178L15P-TZ						Industrial use
HA178L15A-TZ		±5				UPAK
HA178L15PA-TZ			Industrial use			
HA178L15UA-TL			Commercial use			

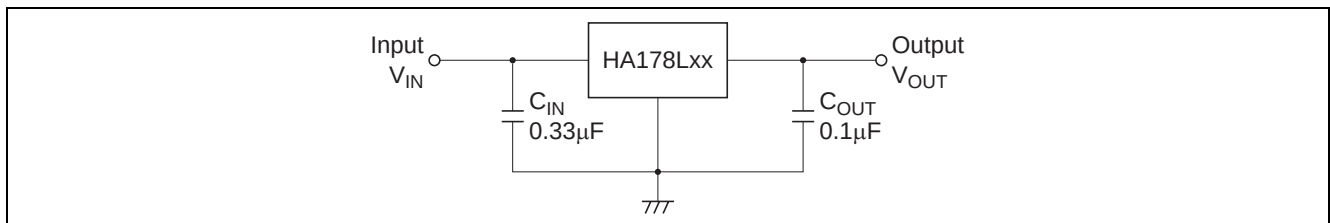
Pin Arrangement



Block Diagram



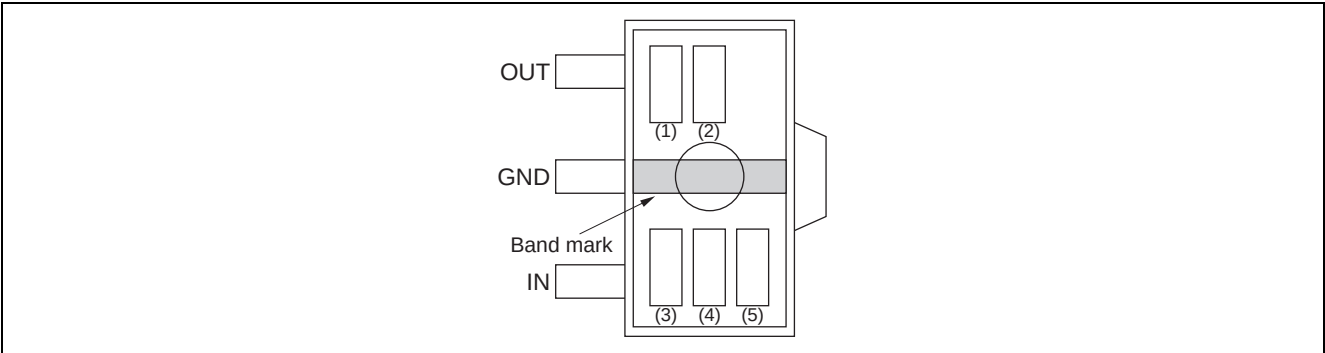
Standard Circuit



UPAK Product (HA178L00UA) Mark Patterns

The mark patterns shown below are used on UPAK products, as the package is small. Note that the product code and mark pattern are different.

The pattern is laser-printed.



- Notes: 1. Boxes (1) to (5) in the figures show the position of the letters or numerals, and are not actually marked on the package.
2. (1) and (2) show the product-specific mark pattern.

Output Voltage (V)	Part No.	Mark Pattern (2 digit)
5	HA178L05UA	8B
8	HA178L08UA	8E
12	HA178L12UA	8H
15	HA178L15UA	8J

3. (3) shows the production year code (the last digit of the year).
4. (4) shows the production month code.

Production Month	1	2	3	4	5	6	7	8	9	10	11	12
Marked Code	A	B	C	D	E	F	G	H	J	K	L	M

5. (5) shows the production week code.

Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Rating	Unit	Note
Input voltage	V_{IN}	35	V	
Power dissipation	P_T	800	mW	TO-92 MOD * ¹
		800		UPAK * ²
Operating ambient temperature	Topr	−40 to +85	°C	
Storage temperature	Tstg	−55 to +150	°C	

Note: 1. Ta ≤ 25°C, If Ta > 25°C, derate by 6.4 mW/°C (See figure A)

2. 15mm × 25mm × 0.7 mm alumina ceramic board, Ta ≤ 25°C (See figure B)

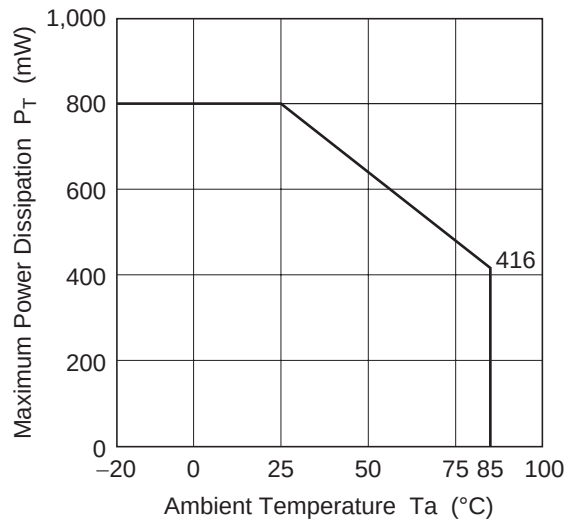


Figure A

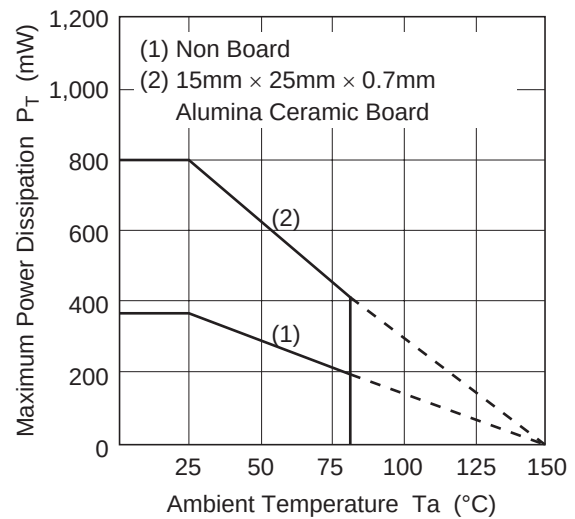


Figure B

Electrical Characteristics

HA178L05

(V_{IN} = 10 V, I_{OUT} = 40 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

Item	Symbol	HA178L05P HA178L05			HA178L05PA HA178L05A HA178L05UA			Unit	Test Conditions	
		Min	Typ	Max	Min	Typ	Max			
Output voltage	V _{OUT}	4.68	5.0	5.32	4.8	5.0	5.2	V	T _j = 25°C	
Line regulation	ΔV _{OLINE}	—	55	200	—	55	150	mV	T _j = 25°C	7 V ≤ V _{IN} ≤ 20 V
		—	45	150	—	45	100			8 V ≤ V _{IN} ≤ 20 V
Load regulation	ΔV _{OLOAD}	—	16	—	—	16	—	mV	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 150 mA
		—	11	60	—	11	60			1.0 mA ≤ I _{OUT} ≤ 100 mA
		—	5.0	30	—	5.0	30			1.0 mA ≤ I _{OUT} ≤ 40 mA
Output voltage	V _{OUT}	4.6	—	5.4	4.75	—	5.25	V	7 V ≤ V _{IN} ≤ 20 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA	
		4.6	—	5.4	4.75	—	5.25		V _{IN} = 10 V, 1.0 mA ≤ I _{OUT} ≤ 70 mA	
Quiescent current	I _Q	—	3.0	6.0	—	3.0	6.0	mA	T _j = 25°C	
Quiescent current change	ΔI _Q	—	—	1.5	—	—	1.5	mA	8.0 V ≤ V _{IN} ≤ 20 V, T _j = 25°C	
		—	—	0.2	—	—	0.1		1.0 mA ≤ I _{OUT} ≤ 40 mA, T _j = 25°C	
Ripple rejection ratio	R _{REJ}	—	58	—	—	58	—	dB	f = 120 Hz, 8.0 V ≤ V _{IN} < 18 V, T _j = 25°C	
Temperature coefficient of output voltage	ΔV _{OUT} /ΔT _j	—	+0.1	—	—	+0.1	—	mV/°C	I _{OUT} = 5 mA	
Dropout voltage	V _{DROP}	—	1.7	—	—	1.7	—	V	T _j = 25°C	

HA178L08

(V_{IN} = 14 V, I_{OUT} = 40 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

Item	Symbol	HA178L08P HA178L08			HA178L08PA HA178L08A HA178L08UA			Unit	Test Conditions	
		Min	Typ	Max	Min	Typ	Max			
Output voltage	V _{OUT}	7.48	8.0	8.52	7.7	8.0	8.3	V	T _j = 25°C	
Line regulation	ΔV _{OLINE}	—	20	200	—	20	175	mV	T _j = 25°C	10.5 V ≤ V _{IN} ≤ 23 V
		—	12	150	—	12	125			11 V ≤ V _{IN} ≤ 23 V
Load regulation	ΔV _{OLOAD}	—	22	—	—	22	—	mV	T _j = 25°C	1.0 mA ≤ I _{OUT} ≤ 150 mA
		—	15	80	—	15	80			1.0 mA ≤ I _{OUT} ≤ 100 mA
		—	7.0	40	—	7.0	40			1.0 mA ≤ I _{OUT} ≤ 40 mA
Output voltage	V _{OUT}	7.36	—	8.64	7.6	—	8.4	V	10.5 V ≤ V _{IN} ≤ 23 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA	
		7.36	—	8.64	7.6	—	8.4		V _{IN} = 14 V, 1.0 mA ≤ I _{OUT} ≤ 70 mA	
Quiescent current	I _Q	—	3.0	6.5	—	3.0	6.5	mA	T _j = 25°C	
Quiescent current change	ΔI _Q	—	—	1.5	—	—	1.5	mA	11 V ≤ V _{IN} ≤ 23 V, T _j = 25°C	
		—	—	0.2	—	—	0.1		1.0 mA ≤ I _{OUT} ≤ 40 mA, T _j = 25°C	
Ripple rejection ratio	R _{REJ}	—	55	—	—	55	—	dB	f = 120 Hz, 12 V ≤ V _{IN} < 23 V, T _j = 25°C	
Temperature coefficient of output voltage	ΔV _{OUT} /ΔT _j	—	−0.1	—	—	−0.1	—	mV/°C	I _{OUT} = 5 mA	
Dropout voltage	V _{DROP}	—	1.7	—	—	1.7	—	V	T _j = 25°C	

HA178L12

(V_{IN} = 19 V, I_{OUT} = 40 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

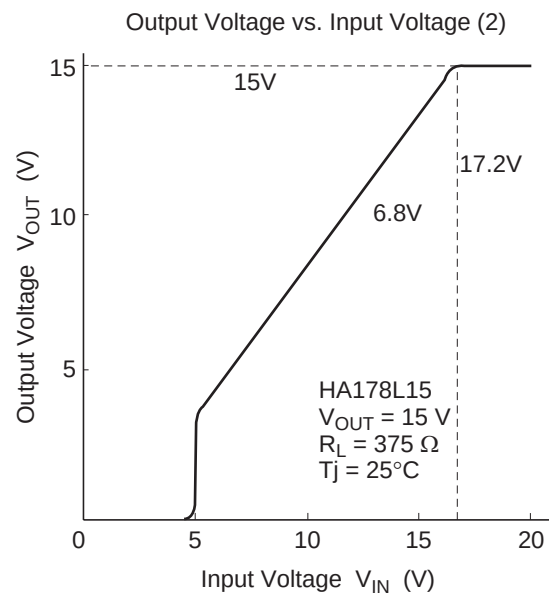
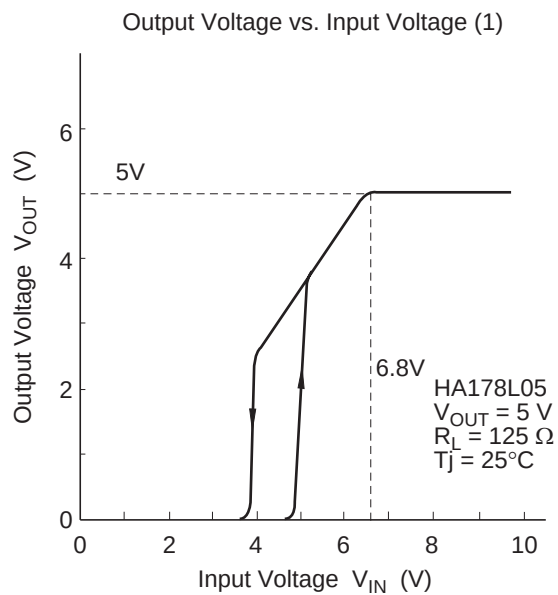
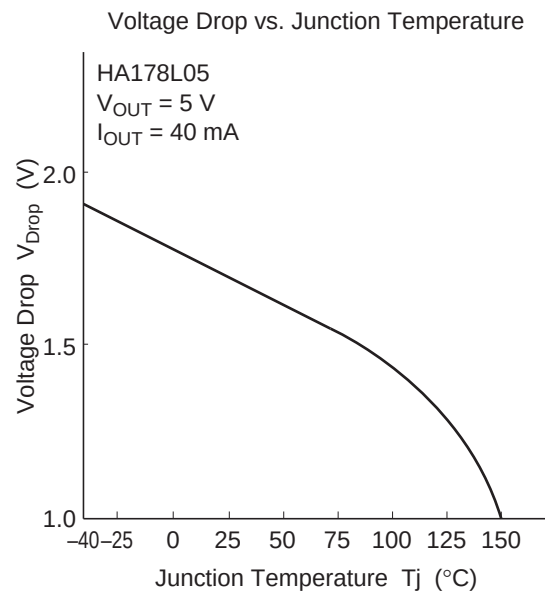
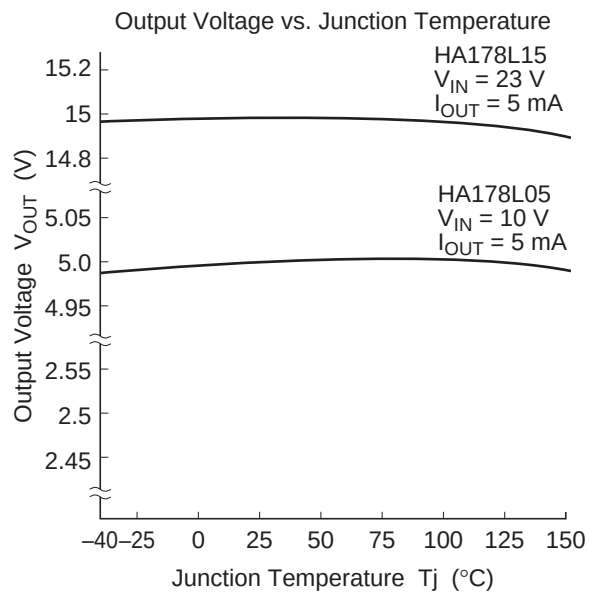
Item	Symbol	HA178L12P HA178L12			HA178L12PA HA178L12A HA178L12UA			Unit	Test Conditions
		Min	Typ	Max	Min	Typ	Max		
Output voltage	V _{OUT}	11.22	12	12.78	11.5	12	12.5	V	T _j = 25°C
Line regulation	ΔV _{OLINE}	—	120	250	—	120	250	mV	T _j = 25°C
		—	100	200	—	100	200		14.5 V ≤ V _{IN} ≤ 27 V 16 V ≤ V _{IN} ≤ 27 V
Load regulation	ΔV _{OLOAD}	—	28.5	—	—	28.5	—	mV	T _j = 25°C
		—	20	100	—	20	100		1.0 mA ≤ I _{OUT} ≤ 150 mA 1.0 mA ≤ I _{OUT} ≤ 100 mA
		—	10	50	—	10	50		1.0 mA ≤ I _{OUT} ≤ 40 mA
Output voltage	V _{OUT}	11.04	—	12.96	11.4	—	12.6	V	14.5 V ≤ V _{IN} ≤ 27 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA
		11.04	—	12.96	11.4	—	12.6		V _{IN} = 19 V, 1.0 mA ≤ I _{OUT} ≤ 70 mA
Quiescent current	I _Q	—	3.1	6.5	—	3.1	6.5	mA	T _j = 25°C
Quiescent current change	ΔI _Q	—	—	1.5	—	—	1.5	mA	16 V ≤ V _{IN} ≤ 27 V, T _j = 25°C
		—	—	0.2	—	—	0.1		1.0 mA ≤ I _{OUT} ≤ 40 mA, T _j = 25°C
Ripple rejection ratio	R _{REJ}	—	52	—	—	52	—	dB	f = 120 Hz, 15 V ≤ V _{IN} < 25 V, T _j = 25°C
Temperature coefficient of output voltage	ΔV _{OUT} /ΔT _j	—	−0.3	—	—	−0.3	—	mV/°C	I _{OUT} = 5 mA
Dropout voltage	V _{DROP}	—	1.7	—	—	1.7	—	V	T _j = 25°C

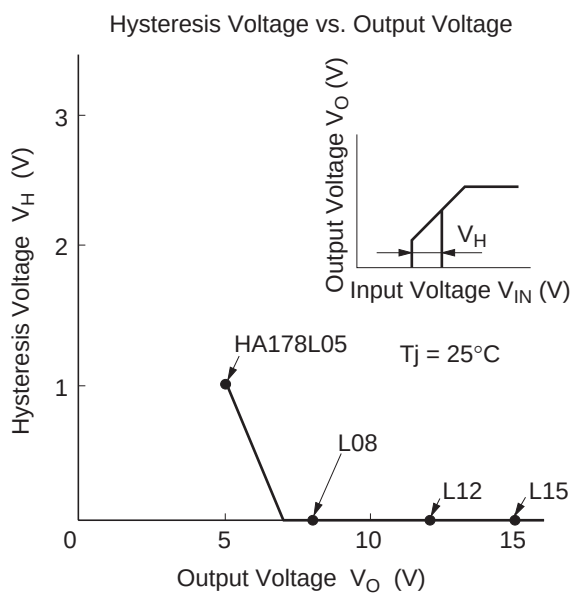
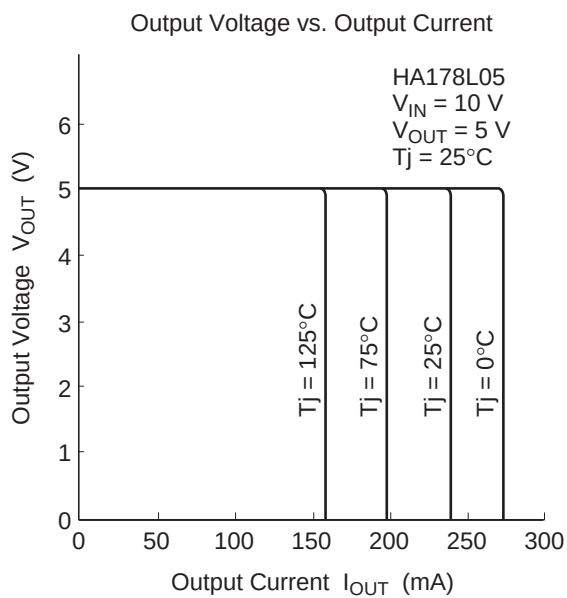
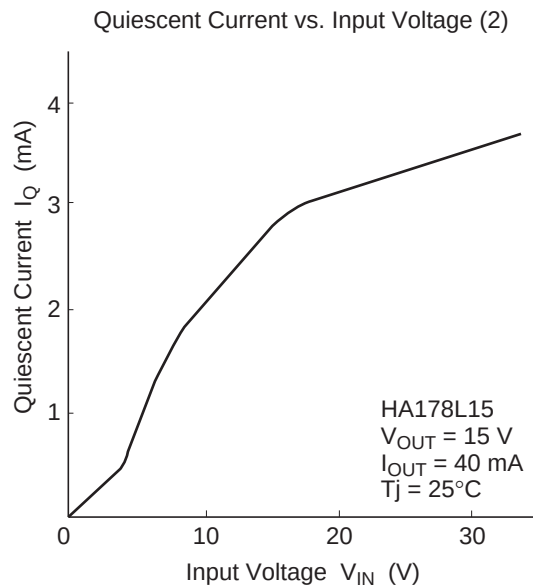
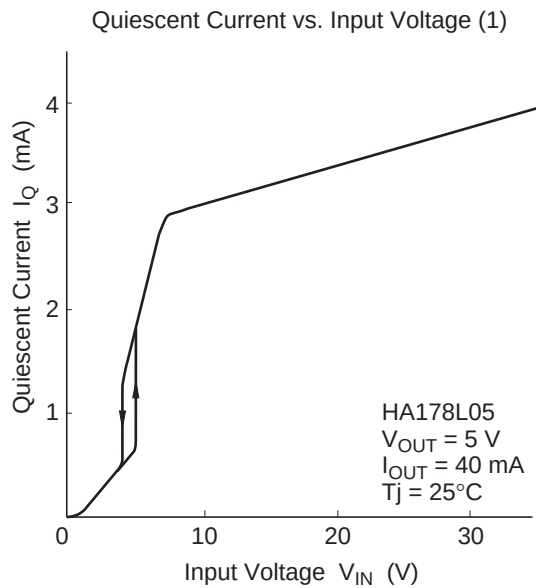
HA178L15

(V_{IN} = 23 V, I_{OUT} = 40 mA, 0°C ≤ T_j ≤ 125°C, C_{IN} = 0.33 μF, C_{OUT} = 0.1 μF)

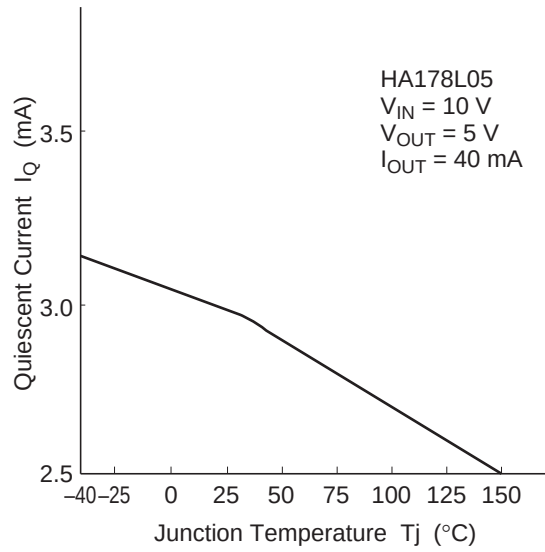
Item	Symbol	HA178L15P HA178L15			HA178L15PA HA178L15A HA178L15UA			Unit	Test Conditions
		Min	Typ	Max	Min	Typ	Max		
Output voltage	V _{OUT}	14.03	15	15.97	14.4	15	15.6	V	T _j = 25°C
Line regulation	ΔV _{OLINE}	—	130	300	—	130	300	mV	T _j = 25°C
		—	110	250	—	110	250		17.5 V ≤ V _{IN} ≤ 30 V 20 V ≤ V _{IN} ≤ 30 V
Load regulation	ΔV _{OLOAD}	—	36	—	—	36	—	mV	T _j = 25°C
		—	25	150	—	25	150		1.0 mA ≤ I _{OUT} ≤ 150 mA 1.0 mA ≤ I _{OUT} ≤ 100 mA
		—	12	75	—	12	75		1.0 mA ≤ I _{OUT} ≤ 40 mA
Output voltage	V _{OUT}	13.8	—	16.2	14.25	—	15.75	V	17.5 V ≤ V _{IN} ≤ 30 V, 1.0 mA ≤ I _{OUT} ≤ 40 mA
		13.8	—	16.2	14.25	—	15.75		V _{IN} = 23 V, 1.0 mA ≤ I _{OUT} ≤ 70 mA
Quiescent current	I _Q	—	3.2	6.5	—	3.2	6.5	mA	T _j = 25°C
Quiescent current change	ΔI _Q	—	—	1.5	—	—	1.5	mA	20 V ≤ V _{IN} ≤ 30 V, T _j = 25°C
		—	—	0.2	—	—	0.1		1.0 mA ≤ I _{OUT} ≤ 40 mA, T _j = 25°C
Ripple rejection ratio	R _{REJ}	—	49	—	—	49	—	dB	f = 120 Hz, 18.5 V ≤ V _{IN} < 28.5 V, T _j = 25°C
Temperature coefficient of output voltage	ΔV _{OUT} /ΔT _j	—	−0.5	—	—	−0.5	—	mV/°C	I _{OUT} = 5 mA
Dropout voltage	V _{DROP}	—	1.7	—	—	1.7	—	V	T _j = 25°C

Characteristic Curves

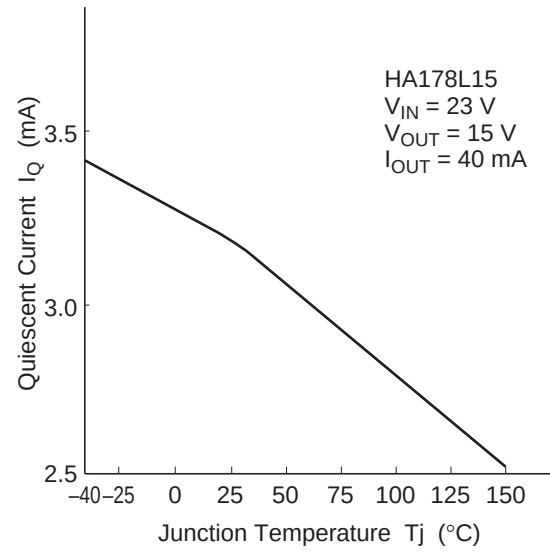




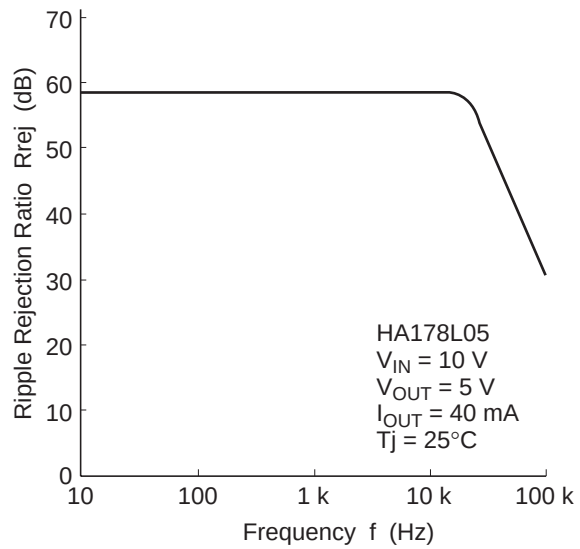
Quiescent Current vs. Junction Temperature (1)



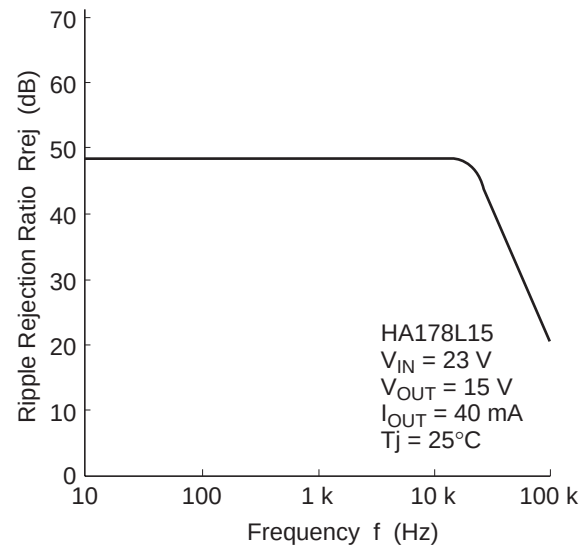
Quiescent Current vs. Junction Temperature (2)



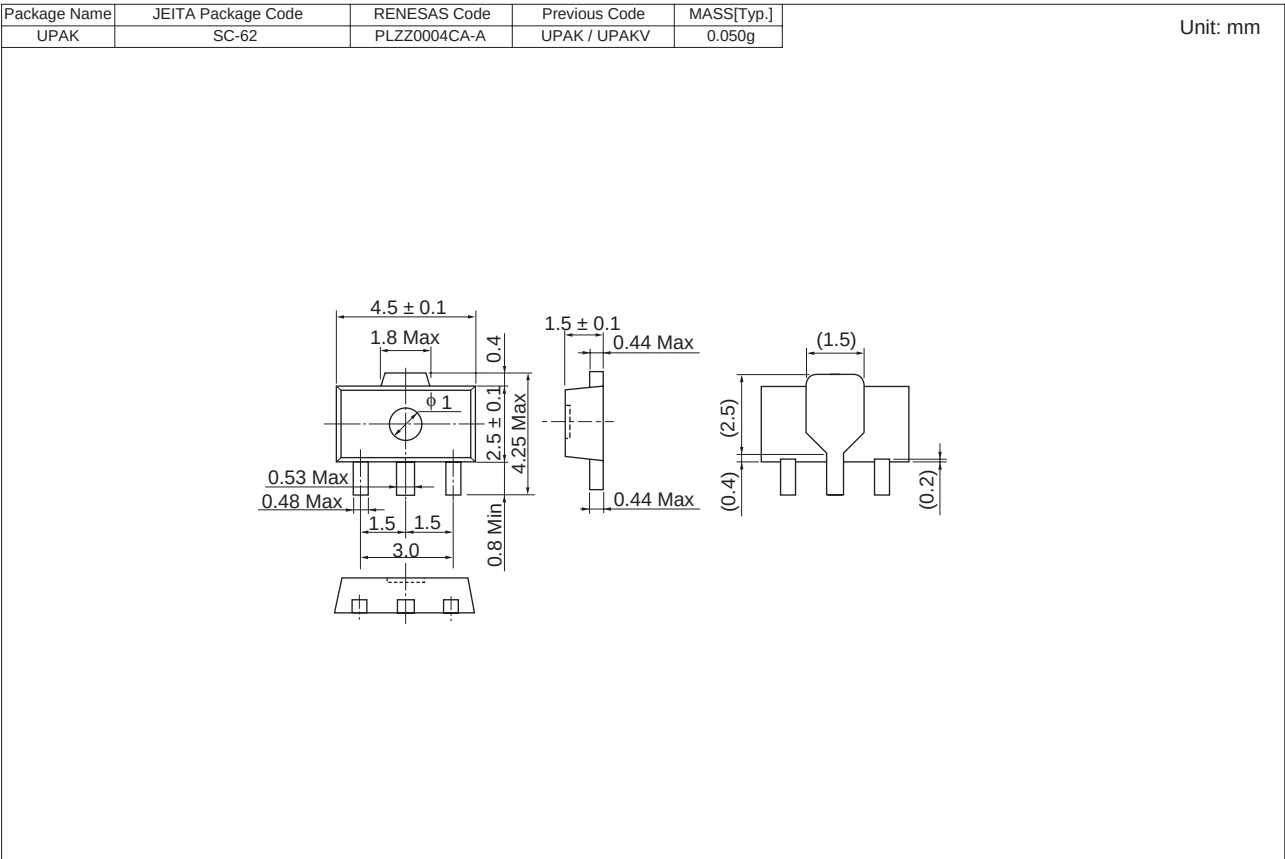
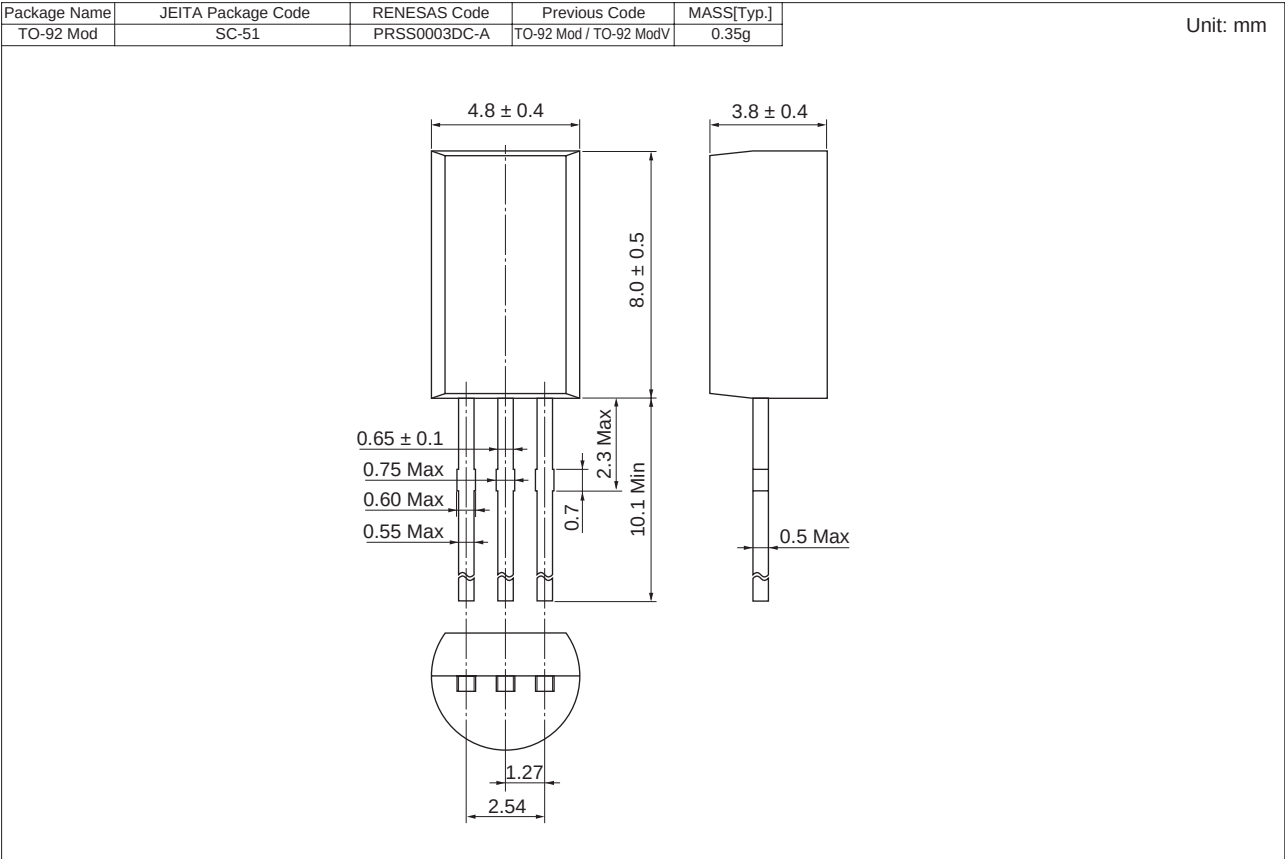
Ripple Rejection Ratio vs. Frequency (1)



Ripple Rejection Ratio vs. Frequency (2)



Package Dimensions



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